

# Modulverzeichnis

**Master-Studiengang "Hydrogeology and Environmental Geoscience" - referring to:  
Prüfungs- und Studienordnung für den  
konsekutiven Master-Studiengang "Hydrogeology and Environmental Geoscience" (Amtliche  
Mitteilungen I 10/2011 p. 763, last revised  
through Amtliche Mitteilungen I 46/2015 p. 1398)**

---



---

## Module

M.HEG.11: General Tools.....	9518
M.HEG.12: Hydrogeology I.....	9519
M.HEG.13: Hydrogeochemistry.....	9520
M.HEG.14: Hydrology and GIS.....	9521
M.HEG.21: Hydrogeology II.....	9523
M.HEG.22: Groundwater Modeling I.....	9524
M.HEG.23: Geophysics.....	9526
M.HEG.24: Georeservoirs I - Processes and Characterization.....	9527
M.HEG.310: Groundwater Modeling II.....	9528
M.HEG.320: Georeservoirs II - Environments and Applications.....	9529
M.HEG.330: Advanced methods in Hydrogeology.....	9530
M.HEG.340: Selected Topics in Hydrogeology.....	9532
M.HEG.351: Planning, Working, Writing and Presenting in Science - Fundamentals of geology.....	9533
M.HEG.352: Planning, Working, Writing and Presenting in Science - Fractured and Karstified Aquifers...	9535
M.HEG.353: Planning, Working, Writing and Presenting in Science - Site Investigation and Modelling.....	9537
M.HEG.354: Planning, Working, Writing and Presenting in Science - GIS & Remote Sensing.....	9539
M.HEG.355: Planning, Working, Writing and Presenting in Science - Groundwater Modeling II.....	9541
M.HEG.356: Planning, Working, Writing and Presenting in Science - Hydrogeochemistry.....	9543
M.HEG.357: Planning, Working, Writing and Presenting in Science - Isotope Geochemistry.....	9545
M.HEG.358: Planning, Working, Writing and Presenting in Science - Georeservoirs.....	9547

# Übersicht nach Modulgruppen

## I. Master-Studiengang "Hydrogeology and Environmental Geoscience"

Es müssen wenigstens 120 C erworben werden.

### 1. Fachstudium

Es müssen die folgenden zwölf Module im Umfang von insgesamt 79 C erfolgreich absolviert werden:

M.HEG.11: General Tools (9 C, 6 SWS).....	9518
M.HEG.12: Hydrogeology I (8 C, 6 SWS).....	9519
M.HEG.13: Hydrogeochemistry (6 C, 5 SWS).....	9520
M.HEG.14: Hydrology and GIS (6 C, 5 SWS).....	9521
M.HEG.21: Hydrogeology II (8 C, 6 SWS).....	9523
M.HEG.22: Groundwater Modeling I (6 C, 5 SWS).....	9524
M.HEG.23: Geophysics (6 C, 4 SWS).....	9526
M.HEG.24: Georeservoirs I - Processes and Characterization (6 C, 4 SWS).....	9527
M.HEG.310: Groundwater Modeling II (8 C, 5 SWS).....	9528
M.HEG.320: Georeservoirs II - Environments and Applications (5 C, 4 SWS).....	9529
M.HEG.330: Advanced methods in Hydrogeology (8 C, 5 SWS).....	9530
M.HEG.340: Selected Topics in Hydrogeology (3 C, 2 SWS).....	9532

### 2. Professionalisierungsbereich Wahlpflichtmodule

Es muss eines der Modul aus der folgenden Gruppe im Umfang von insgesamt 5 C erfolgreich absolviert werden.

M.HEG.351: Planning, Working, Writing and Presenting in Science - Fundamentals of geology (5 C, 4 SWS).....	9533
M.HEG.352: Planning, Working, Writing and Presenting in Science - Fractured and Karstified Aquifers (5 C, 4 SWS).....	9535
M.HEG.353: Planning, Working, Writing and Presenting in Science - Site Investigation and Modelling (5 C, 4 SWS).....	9537
M.HEG.354: Planning, Working, Writing and Presenting in Science - GIS & Remote Sensing (5 C, 4 SWS).....	9539
M.HEG.355: Planning, Working, Writing and Presenting in Science - Groundwater Modeling II (5 C, 4 SWS).....	9541
M.HEG.356: Planning, Working, Writing and Presenting in Science - Hydrogeochemistry (5 C, 4 SWS).....	9543

M.HEG.357: Planning, Working, Writing and Presenting in Science - Isotope Geochemistry (5 C, 4 SWS)..... 9545

M.HEG.358: Planning, Working, Writing and Presenting in Science - Georeservoirs (5 C, 4 SWS).9547

### **3. Schlüsselkompetenzen**

Es muss wenigstens ein Modul im Umfang von insgesamt wenigstens 6 C aus dem Modulverzeichnis für Schlüsselkompetenzen der Universität Göttingen erfolgreich absolviert werden.

### **4. Masterarbeit**

Durch die erfolgreiche Anfertigung der Masterarbeit werden 30 C erworben.

## **II. Prüfungsformen**

Soweit in diesem Modulverzeichnis Modulbeschreibungen in englischer Sprache veröffentlicht werden, gilt für die verwendeten Prüfungsformen nachfolgende Zuordnung:

- Oral examination = mündliche Prüfung [§ 15 Abs. 8 APO]
- Written examination = Klausur [§ 15 Abs. 9 APO]
- Term paper = Hausarbeit [§ 15 Abs. 11 APO]
- Presentation = Präsentation [§ 15 Abs. 12 APO]
- Presentation with written elaboration = Präsentation mit schriftlicher Ausarbeitung [§ 15 Abs. 12 APO]

APO = Allgemeinen Prüfungsordnung für Bachelor- und Master-Studiengänge sowie sonstige Studienangebote an der Universität Göttingen

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.11: General Tools</b> <i>English title: General Tools</i>		9 C 6 SWS
<b>Lernziele/Kompetenzen:</b> This module is designed to provide some of the basic prerequisites and general tools for the students to be able to follow the Master Course. The individual courses comprise fundamentals of mathematics required within the context of groundwater and systems modeling and a programming course. The course in Mathematics cannot replace an intensive study of the mathematical foundations for those with less mathematical background. The course Fundamentals of Geology comprises a comprehensive review of the history of Earth, the main rock-forming processes, and changes of the Earth surface under atmospheric conditions.		<b>Arbeitsaufwand:</b> Präsenzzeit: 84 Stunden Selbststudium: 186 Stunden
<b>Lehrveranstaltung: Scientific Programming</b> (Übung, Vorlesung)		2 SWS
<b>Prüfung: Praktische Prüfung, unbenotet</b>		3 C
<b>Lehrveranstaltung: Mathematics</b> (Übung, Vorlesung)		2 SWS
<b>Prüfung: Klausur (60 Minuten)</b>		3 C
<b>Lehrveranstaltung: Fundamentals of Geology</b> (Vorlesung)		2 SWS
<b>Prüfung: Klausur (60 Minuten)</b>		3 C
<b>Prüfungsanforderungen:</b> Understanding of basic principles of mathematical procedures in natural sciences and information processing of spatial data.		
<b>Zugangsvoraussetzungen:</b> keine	<b>Empfohlene Vorkenntnisse:</b> keine	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. Alfons M. van den Kerkhof Dr. Jannes Kordilla	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 1	
<b>Maximale Studierendenzahl:</b> 25		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.12: Hydrogeology I</b> <i>English title: Hydrogeology I</i>	8 C 6 SWS
<b>Lernziele/Kompetenzen:</b> This module is intended to convey the fundamentals of the theory of groundwater flow and transport and to apply them in practical exercises in the field and in the laboratory. The students should be able to organise and conduct test procedures as well as to assess the specific hydrogeological site conditions. The contents of the module comprise the hydrological water balance, groundwater recharge estimation techniques, groundwater hydrology, pumping test evaluation and principles of solute transport. Relevance of this fundamental material is illustrated with examples from the hydrogeological practice, e.g. water resources exploration, and groundwater remediation. The advanced course on "Aquifersystems" will concentrate on the specifics of fractured aquifers and the particulars of the large variety of aquifer systems in Northern Germany. They can be regarded as representative for a large number of aquifer types.	<b>Arbeitsaufwand:</b> Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Introduction to Hydrogeology</b> (Übung, Vorlesung) <b>2. Advanced Hydrogeological Investigation Techniques</b> (Vorlesung) <b>3. Geology of Aquifer systems</b> (Vorlesung, Exkursion) <b>4. Well Design and Construction</b> (Vorlesung)	3 SWS 1 SWS 1 SWS 1 SWS
<b>Prüfung: Klausur (60 Minuten)</b>	8 C
<b>Prüfungsanforderungen:</b> Theory and practice of groundwater flow and solute transport processes, implementation in the field.	
<b>Zugangsvoraussetzungen:</b> keine	<b>Empfohlene Vorkenntnisse:</b> keine
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Jannes Kordilla Prof.Dr. Martin Sauter
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 1
<b>Maximale Studierendenzahl:</b> 25	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.13: Hydrogeochemistry</b> <i>English title: Hydrogeochemistry</i>		6 C 5 SWS
<b>Lernziele/Kompetenzen:</b> The module intends to convey an understanding for the role of chemical processes in water-rock interaction. The first lecture introduces the essential thermodynamics to understand basic and coupled electrolyte equilibria (i.e. redox processes, acid/base reactions, solubility) in the aquatic environment and is accompanied by simple and complex calculations of real world problems as well as coursework. The second lecture focuses on the classification of organic compounds and pollutants in the subsurface. Relevant properties are discussed together with property-structure-relationships. The environmental and subsurface behaviour of organic compounds is introduced in terms of relevant distribution equilibria and kinetically controlled processes. Complex examples are provided partially as coursework helping to apply gained knowledge. The third lecture is an exercise to practice the knowledge using multiple choice tests.		<b>Arbeitsaufwand:</b> Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Inorganic Hydrogeochemistry</b> (Vorlesung) <b>2. Organic Hydrogeochemistry</b> (Vorlesung) <b>3. Exercise in Hydrogeochemistry</b> (Übung)		2 SWS 2 SWS 1 SWS
<b>Prüfung: Klausur (90 Minuten)</b>		6 C
<b>Prüfungsanforderungen:</b> Knowledge about basic inorganic equilibrium water chemistry, water chemistry data interpretation, contaminant classes, basic organic chemistry, structure-properties relationships for organic compounds, distribution equilibria		
<b>Zugangsvoraussetzungen:</b> keine	<b>Empfohlene Vorkenntnisse:</b> Basic knowledge in chemistry	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> PD Dr. rer. nat. Tobias Licha Prof. Dr. Martin Sauter	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 1	
<b>Maximale Studierendenzahl:</b> 25		



<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.14: Hydrology and GIS</b> <i>English title: Hydrology and GIS</i>		6 C 5 SWS
<b>Lernziele/Kompetenzen:</b> <p>The first course in submodule 1 gives an overview about the fundamentals of surface water hydrology. Main topics are: climate, hydrologic cycle, river basin characterisation, precipitation, surface runoff and river discharge, unsaturated zone assessment, evapotranspiration, river morphology, erosion and sediment transport, precipitation-runoff processes and modeling, water balance, surface water quality assessment, hydrometry, regionalization and hydrological mapping, open channel hydraulics and fundamentals of hydraulic modeling.</p> <p>The second course focuses on urban hydrology and groundwater management issues. Further important aspects are: e.g. impact of urban development on groundwater, sustainable management and protection of groundwater resources in urban environments, innovative management concepts.</p> <p>The first course in submodule 2 provides knowledge about basic GIS techniques (e.g. spatial data models, data input techniques, spatial analysis) applied in hydrologic, geological and environmental studies. Students gain practical skills by computer exercises with state of the art software.</p> <p>The second course offers the opportunity to become acquainted with basic remote sensing techniques (correction, composites, ratios, indices, PCA, classification) using common multispectral datasets. Students will mainly work on practical exercises that focus on the application of digital image processing in geological, hydrologic and environmental case studies.</p>		<b>Arbeitsaufwand:</b> Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Fundamentals of Surface Water Hydrology</b> (Vorlesung) <b>2. Urban Hydrology and Groundwater Management</b> (Vorlesung)		1 SWS 1 SWS
<b>Prüfung: Klausur (45 Minuten)</b> <b>Prüfungsanforderungen:</b> Understanding of basic principles and application of state of the art methods in surface water hydrology.		3 C
<b>Lehrveranstaltungen:</b> <b>1. Geographic Information Systems (GIS)</b> (Übung) <b>2. Applied Remote Sensing Techniques</b> (Übung)		2 SWS 1 SWS
<b>Prüfung: Praktische Prüfung (90 Minuten)</b> <b>Prüfungsanforderungen:</b> Practical application of GIS and Remote Sensing techniques on provided datasets.		3 C
<b>Zugangsvoraussetzungen:</b> keine	<b>Empfohlene Vorkenntnisse:</b> Basic knowlegde in Geology, Computer Literacy, Cartography, Geography	
<b>Sprache:</b>	<b>Modulverantwortliche[r]:</b>	

Englisch	Dr. rer. nat. Bianca Wagner
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 1
<b>Maximale Studierendenzahl:</b> 25	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.21: Hydrogeology II</b> <i>English title: Hydrogeology II</i>	8 C 6 SWS
<b>Lernziele/Kompetenzen:</b> This module builds on the foundations of „Hydrogeology I“and concentrates on specific relevant fields. The first and second course focus on the understanding and modeling of processes, their interaction and weighting on groundwater catchment scale. Mass balances for sub systems and their individual impact on the whole mass balance for groundwater catchments are addressed. The third course will convey principles of field testing techniques employed in hydrogeology such as pumping tests, slug tests, tracer experiments, sampling as well as direct push investigation methods.	<b>Arbeitsaufwand:</b> Präsenzzeit: 84 Stunden Selbststudium: 156 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Catchment Hydrogeology</b> (Übung, Vorlesung) <b>2. Hydrological and Hydrogeological Monitoring</b> (Übung, Vorlesung) <b>3. Catchment Hydrogeology and Monitoring Field Seminar</b> (Exkursion) <b>4. Fractured and Karstified Aquifers</b> (Exkursion)	1 SWS 1 SWS 1 SWS 1 SWS
<b>Prüfung: Klausur (60 Minuten)</b> <b>Prüfungsvorleistungen:</b> Compulsory attendance in the Catchment Hydrogeology Field Seminar and the Fractured and Karstified Aquifers excursion	5 C
<b>Lehrveranstaltung: Hydrogeological Field Seminar</b> (Exkursion)	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> Compulsory attendance in the Hydrogeological Field Seminar	3 C
<b>Prüfungsanforderungen:</b> Theory of flow and transport processes on groundwater catchment scale, theory and practical application of hydrogeological characterisation techniques using field investigation methods	
<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12	<b>Empfohlene Vorkenntnisse:</b> keine
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr.-Ing. habil. Thomas Ptak-Fix
<b>Angebotshäufigkeit:</b> jedes Sommersemester	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 2
<b>Maximale Studierendenzahl:</b> 25	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.22: Groundwater Modeling I</b> <i>English title: Groundwater Modeling I</i>	6 C 5 SWS
--	--------------

<b>Lernziele/Kompetenzen:</b> This module introduces the student to the commonly used mathematical tools as well as to state-of-the-art numerical groundwater modeling techniques, including visualization of the results. Groundwater modeling allows a consistent assembly of multiple types of data from laboratory and field investigations, environmental system analysis, process understanding, planning of water management and remedial activities, risk assessment, decision making etc.. The first and second course focuses on the numerical modeling of flow and non-reactive as well as reactive transport in porous media (aquifers). It includes topics such as model design, mathematical process formulation (process equations) and numerical methods for solving the governing equations. Simple modeling problems will be discussed and exercised by the students using computer codes in tutorials to complement the presentations given in the lecture. The third course deals with special advanced modeling techniques. The focus will be on basin scale integrated hydrosystem modeling, covering porous and fractured media, saturated and unsaturated zones, surface water - groundwater interaction, surface water modeling, hillslope hydrological aspects, including reactive contaminant transport. Students will gain hands on experience with models through computer exercises.	<b>Arbeitsaufwand:</b> Präsenzzeit: 70 Stunden Selbststudium: 110 Stunden
---	---

<b>Lehrveranstaltungen:</b> <b>1. Groundwater Flow Modeling</b> (Übung, Vorlesung) <b>2. Groundwater Transport Modeling</b> (Übung, Vorlesung) <b>3. Advanced Modeling Techniques</b> (Übung, Vorlesung)	2 SWS 2 SWS 1 SWS
---	-------------------------

<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> Compulsory attendance in all 3 exercises	6 C
--	-----

<b>Prüfungsanforderungen:</b> Knowledge about theoretic background and state of the art techniques in groundwater modelling, understanding of main concepts of integrated hydrosystem modelling and practical skills.	
--	--

<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12, M.HEG.13	<b>Empfohlene Vorkenntnisse:</b> keine
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr.-Ing. habil. Thomas Ptak-Fix Prof. Dr. Martin Sauter
<b>Angebotshäufigkeit:</b> jedes Sommersemester	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 2

<b>Maximale Studierendenzahl:</b>	
-----------------------------------	--

25	
----	--

<b>Georg-August-Universität Göttingen</b>		6 C 4 SWS
<b>Modul M.HEG.23: Geophysics</b> <i>English title: Geophysics</i>		
<b>Lernziele/Kompetenzen:</b> In this module the students will learn to understand in how far the methods of Applied Geophysics can assist in the hydraulic characterisation of aquifers, the detection of different quality waters as well as general concepts of parameter regionalisation in three-dimensional space. The module is composed of a lecture, concentrating on the theory and the presentation of the basic techniques employed in Applied Geophysics, i.e. seismics, resistivity techniques, magnetics, gravimetry and borehole geophysics. Their relevance for hydrogeological problems is illustrated with examples. The field course builds on this foundation and demonstrates practical application of the various techniques in the field.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden
<b>Lehrveranstaltung: Applied Geophysics and Hydrogeophysics</b> (Übung, Vorlesung)		2 SWS
<b>Prüfung: Klausur (90 Minuten)</b>		3 C
<b>Lehrveranstaltung: Geophysical Field Seminar</b> (Exkursion)		2 SWS
<b>Prüfung: Hausarbeit (max. 5 Seiten), unbenotet</b>		3 C
<b>Prüfungsanforderungen:</b> Theory and practical application of applied geophysical methods in the solution of hydrogeological problems.		
<b>Zugangsvoraussetzungen:</b> keine	<b>Empfohlene Vorkenntnisse:</b> keine	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr. Andreas Weller Prof. Dr. Martin Sauter	
<b>Angebotshäufigkeit:</b> jedes Sommersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 2	
<b>Maximale Studierendenzahl:</b> 25		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.24: Georeservoirs I - Processes and Characterization</b> <i>English title: Georeservoirs I - Processes and Characterization</i>		6 C 4 SWS
<b>Lernziele/Kompetenzen:</b> Georeservoirs represent important hydrogeological systems for renewable energy, hydrocarbons, for gas and energy storage, CO <sub>2</sub> capture and sequestration, and radioactive waste disposal. The module "Georeservoirs I" provides a general overview of the concepts of georeservoirs by conveying the relevant physical and chemical processes that are effective in deep rock formations at reservoir scale. The module is subdivided into (1) "Fluid flow, mass and heat transport": while M.HEG.12 and M.HEG.22 conveyed the basics of subsurface flow and transport, this course addresses flow and transport from the special aspect of THMC (hydraulic, thermal, mechanical and chemical) process coupling in selected georeservoir types during different operation regimes, and with a focus on the interaction between natural technically induced processes (e.g., drilling, stimulation and/or fracturing) and (2) "Geochemistry and Geomechanics" teaches fundamentals of geomechanical and geochemical processes in large-scale deep reservoirs for sustainable exploitation. During the course, field examples will be presented and discussed.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 124 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Fluid flow, Mass and Heat Transport</b> (Übung, Vorlesung) <b>2. Geochemistry and Geomechanics</b> (Übung, Vorlesung)		2 SWS 2 SWS
<b>Prüfung: Klausur (120 Minuten)</b>		6 C
<b>Prüfungsanforderungen:</b> Understanding of georeservoir functioning and of coupled THMC processes, qualitative predictions of georeservoir dynamics, understanding of the principles of geomechanical and geochemical methods and their applications to georeservoirs.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12, M.HEG.13	<b>Empfohlene Vorkenntnisse:</b> keine	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Bettina Wiegand Dr. Iulia Ghergut	
<b>Angebotshäufigkeit:</b> jedes Sommersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 2	
<b>Maximale Studierendenzahl:</b> 25		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.310: Groundwater Modeling II</b> <i>English title: Groundwater Modeling II</i>		8 C 5 SWS
<b>Lernziele/Kompetenzen:</b> The first course focuses on unsaturated zone processes. Lectured topics include: soil-water-plant-atmosphere system, soil-water, energy and solute balance, soil physics, soil water flow and reactive transport, mathematical models, groundwater recharge and protection, environmental monitoring. The second course introduces the students to flow and transport modeling in fractured and karstified media. Main topics are the geological characterization of fractured aquifers, complex and non-linear flow processes that arise from the highly heterogeneous nature of fractured aquifers, and how they can be modeled using analytical and numerical techniques ranging from pore- to fieldscale. The third course deals with the reactive (non-conservative) transport of solutes in the saturated zone. The main focus is on the superposition of the underlying processes (e.g., dispersion, sorption, degradation) and their implications for the transport of contaminants and reactive tracers in the subsurface. Further, common analytical modeling approaches are introduced.		<b>Arbeitsaufwand:</b> Präsenzzeit: 70 Stunden Selbststudium: 170 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Modeling of unsaturated Zone Processes</b> (Übung, Vorlesung) <b>2. Simulation of Flow and Transport in Fractured and Karstified Aquifers</b> (Übung, Vorlesung) <b>3. Reactive Transport Processes</b> (Übung, Vorlesung)		2 SWS 2 SWS 1 SWS
<b>Prüfung: Klausur (90 Minuten)</b>		8 C
<b>Prüfungsanforderungen:</b> Understanding of main concepts of unsaturated zone processes, theory of simulation of flow and transport processes in fractured/karstified media and reactive transport.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12, M.HEG.22	<b>Empfohlene Vorkenntnisse:</b> keine	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Jannes Kordilla	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3	
<b>Maximale Studierendenzahl:</b> 25		



<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.320: Georeservoirs II - Environments and Applications</b> <i>English title: Georeservoirs II - Environments and Applications</i>		5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> This module intends to convey a dynamic understanding of processes, parameters, and techniques involved in georeservoir evaluation and exploitation. The module comprises (1) "Deep Geothermics", describing the sources and mechanisms of heat production and transport within the Earth's crust, examining the distribution of geothermal resources around the world, defining economic criteria for site selection, presenting the commonly-employed field testing procedures, energy output and efficiency calculations, and providing a regional assessment of potential geothermal resources in Germany and Europe; (2) "Georeservoir Engineering" explains the techniques necessary to create, monitor, maintain and improve access to target georesources, and hazards related to these techniques, with a focus on hydrocarbon and geothermal reservoir design (multi-well, single-well, multi-frac, etc.) and stimulation techniques (matrix treatment, fracturing where applicable); it further presents fluid turnover- and pressure-based (i.e., artificial tracers and hydraulics) testing and evaluation protocols suitable to specific stages of reservoir lifetime, from drilling and early production to late depleted states. The application of these techniques is illustrated with single- and two-phase systems from the hydrocarbon and geothermal field.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltungen:</b> <b>1. Deep Geothermics</b> (Übung, Vorlesung) <b>2. Georeservoirs Engineering</b> (Übung, Vorlesung)		2 SWS 2 SWS
<b>Prüfung: Klausur (60 Minuten)</b>		5 C
<b>Prüfungsanforderungen:</b> Heat sources and transport within the Earth's crust, geothermal resource classification; reservoir productivity and lifetime calculations; commonly-employed schemes/protocols for georeservoir design, testing, evaluation and treatment.		
<b>Zugangsvoraussetzungen:</b> M.HEG.12, M.HEG.22, M.HEG.24	<b>Empfohlene Vorkenntnisse:</b> Good knowledge of hydraulic and tracer test methods and insight into coupled THMC processes.	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Iulia Ghergut	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3	
<b>Maximale Studierendenzahl:</b> 25		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.330: Advanced methods in Hydrogeology</b> <i>English title: Advanced methods in Hydrogeology</i>		8 C 5 SWS
<b>Lernziele/Kompetenzen:</b> Using isotope ratios to trace sources of water and solutes in the hydrological cycle has a long tradition. The lecture in isotope hydrology provides an introduction to the broad spectrum of traditional and new methods that are currently applied in the field of hydrogeology and environmental geoscience to study the origin of chemical compounds. The lecture will be complemented by the discussion of case studies and practical exercises. The second course introduces the concepts of using organic compounds as indicators and tracers to detect processes in the aquatic environment and in georeservoirs. The selection and application of tracers as well as the design of new tracers will be discussed. The third course focuses on innovative investigation and monitoring techniques. Both integral and high resolution point scale, non-invasive and invasive investigation techniques are presented, and scale-heterogeneity relationship issues are discussed.		<b>Arbeitsaufwand:</b> Präsenzzeit: 70 Stunden Selbststudium: 170 Stunden
<b>Lehrveranstaltungen:</b> 1. <b>Isotope Hydrology</b> (Übung, Vorlesung) 2. <b>Application of Indicators and Tracers</b> (Übung, Vorlesung)		2 SWS 1 SWS
<b>Prüfung: Klausur (90 Minuten)</b>		5 C
<b>Lehrveranstaltung: Investigation Techniques and Monitoring</b> (Übung, Vorlesung)		2 SWS
<b>Prüfung: Klausur (60 Minuten)</b>		3 C
<b>Prüfungsanforderungen:</b> Submodule 1: In depth understanding of isotope methods and their application in hydrogeology, knowledge on tracer design and tracer methods, understanding of using indicators for investigating processes on geosystems. Submodule 2: Innovative equipment providing access to the subsurface, innovative tools allowing groundwater sampling and parameter estimation, innovative subsurface measuring, investigation, characterization and monitoring methods, strategies and approaches.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12, M.HEG.13, M.HEG.21, M.HEG.22	<b>Empfohlene Vorkenntnisse:</b> Basic knowledge in Hydrochemistry, Geology, Hydrogeology und Transport processes	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> PD Dr. rer. nat. Tobias Licha Prof. Dr.-Ing Thomas Ptak-Fix	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	

---

<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 25	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.340: Selected Topics in Hydrogeology</b> <i>English title: Selected Topics in Hydrogeology</i>		3 C 2 SWS
<b>Lernziele/Kompetenzen:</b> Lecture topics vary depending on current innovative research trends in hydrogeology. Courses for example can include those given below: 1. Operations research applications in the field of integrated water resources management (IWRM). The lecture specifically treats: multi-criteria-analysis and multi-objective optimization procedures and their application to specific IWRM topics, such as irrigation planning and management, surface water reservoir planning and operation or Managed Aquifer Recharge. The application of decision support systems in IWRM is discussed, too. Social, political, legal and institutional aspects of IWRM, transboundary and conflict management are treated on an introductory level as well. A part of the course will be organized as seminar organized by the students. 2. The problem of salinity in groundwater, characterization, mapping, modelling and the management of groundwater resources in the presence of salinity, including coastal aquifers and inland aquifers with saline water bodies. The courses can be modified ad hoc to take into account current new topics and scientific methods or to integrate specialised expertise of visiting scientists.		<b>Arbeitsaufwand:</b> Präsenzzeit: 28 Stunden Selbststudium: 62 Stunden
<b>Lehrveranstaltungen:</b> 1. <b>Operations Research in IWRM</b> (Übung, Vorlesung) 2. <b>Saline Groundwater</b> (Übung, Vorlesung)		1 SWS 1 SWS
<b>Prüfung: Klausur (60 Minuten)</b>		3 C
<b>Prüfungsanforderungen:</b> Knowledge as presented in the course on selected topics in the field of integrated water resources management and salinity problems in groundwater.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.12, M.HEG.13	<b>Empfohlene Vorkenntnisse:</b> keine	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr. Martin Sauter	
<b>Angebotshäufigkeit:</b> jedes Wintersemester	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3	
<b>Maximale Studierendenzahl:</b> 25		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.351: Planning, Working, Writing and Presenting in Science - Fundamentals of geology</b> <i>English title: Planning, Working, Writing and Presenting in Science - Fundamentals of geology</i>		5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. This module focusses on geology and/or mineralogy. The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar		2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.		1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Seminar)</b>		1 SWS
<b>Prüfungsanforderungen:</b> A literature review (report) or assigned project (report) on a geological topic, showing the competence of the student to independently process recent literature or conduct a short project study.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11	<b>Empfohlene Vorkenntnisse:</b> Advanced knowledge of geology and/or mineralogy	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. Alfons M. van den Kerkhof	

<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.352: Planning, Working, Writing and Presenting in Science - Fractured and Karstified Aquifers</b> <i>English title: Planning, Working, Writing and Presenting in Science - Fractured and Karstified Aquifers</i>	5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. The module focusses on topics, related to the field of "Fractured and Karstified Rocks" and are concerned with the investigation, characterisation and modelling of groundwater flow and transport in these highly heterogeneous aquifers. Emphasis is mainly placed on water resources aspects and contaminant transport issues. The module is complemented with the discussion of case studies for the illustration of real world problems. The skills acquired are expected to be invested into the preparation of the M.Sc thesis.	<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.	1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>	1 SWS
<b>Prüfungsanforderungen:</b> Students are expected to have developed an understanding of the particular flow dynamics of fractured and karstified rocks as well as transport processes.	

<b>Zugangsvoraussetzungen:</b> M.HEG.12	<b>Empfohlene Vorkenntnisse:</b> keine
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr. Martin Sauter
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	



<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.353: Planning, Working, Writing and Presenting in Science - Site Investigation and Modelling</b> <i>English title: Planning, Working, Writing and Presenting in Science - Site Investigation and Modelling</i>	5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. The focus of this module is (i) on innovative subsurface investigation and monitoring techniques to characterize subsurface properties, groundwater flow and transport behavior etc., and (ii) on mathematical tools as well as state-of-the-art high level process oriented numerical groundwater flow and transport modeling techniques, including geostatistical approaches and parameter optimization tools. Aspects of basin scale integrated hydrosystem modeling, climate change effects, saturated and unsaturated zones, surface water - groundwater interaction, saltwater intrusion, surface water modeling, hillslope hydrology, reactive contaminant transport, contamination backtracking, data fusion, parameter uncertainty and parameter inversion etc. will be covered. The students may compile a literature review report on one of the above topics, or the students will have to accomplish assigned project work on one of the above topics, and to prepare a professional report summarizing the given assignment and the achieved outcome. Project work may cover lab and/or field work, as well as numerical modeling, dealing with real world problems. The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.	<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.	1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b>	2 C

12 participations in the weekly seminar of the Applied Geology department, certified.		
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>		1 SWS
<b>Prüfungsanforderungen:</b> A literature review (report) or assigned project (report) in the area of site investigation and modeling, showing the competence of the student to independently find, understand, interpret and summarize existing and especially recent literature relevant with respect to one of the above topics, or to independently and successfully deal with an assigned high level project aiming at real world problems of site investigation and modeling. Participation in the seminar of the Applied Geology Department.		
<b>Zugangsvoraussetzungen:</b> M.HEG.11	<b>Empfohlene Vorkenntnisse:</b> Basic to advanced knowledge of hydrogeology, site investigation and modelling	
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Prof. Dr.-Ing. habil. Thomas Ptak-Fix	
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester	
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3	
<b>Maximale Studierendenzahl:</b> 4		

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.354: Planning, Working, Writing and Presenting in Science - GIS &amp; Remote Sensing</b> <i>English title: Planning, Working, Writing and Presenting in Science - GIS &amp; Remote Sensing</i>	5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, geometrical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. This module focusses on current research topics in the spatial analysis of geological, hydrological and hydrogeological data (vector and raster data) in two and three dimensions and the application of various analysis and correction tools. The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.	<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.	1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>	1 SWS
<b>Prüfungsanforderungen:</b> Literature review or assigned project in the area of Remote Sensing and/or GIS. The literature review has to cover publications that deal with GIS- or Remote Sensing related methods in Hydrology, Hydrogeology, Geology or Soil Sciences. If the assigned project or master thesis focuses on GIS, the student should create, import, correct and analyze spatial data to solve a scientific question in the above mentioned fields. A Remote Sensing project should comprise data query, preprocessing, correction and processing	

of multispectral satellite images of various sensors and their geological or hydrological analysis and interpretation.	
--	--

<b>Zugangsvoraussetzungen:</b> M.HEG.14	<b>Empfohlene Vorkenntnisse:</b> Geology, GIS, Remote Sensing, Statistics, Software skills
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Bianca Wagner
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.355: Planning, Working, Writing and Presenting in Science - Groundwater Modeling II</b> <i>English title: Planning, Working, Writing and Presenting in Science - Groundwater Modeling II</i>	5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. The module focusses on the numerical modeling of saturated and unsaturated flow and transport processes in fractured and porous media. Main topics are vadose zone flow processes, soil-plant interaction, advanced numerical techniques for pore- and fracturescale flow and transport modeling, influence of fracture network geometry on flow and transport, and modeling of reactive transport. The skills acquired are expected to be invested in the preparation of the M.Sc thesis.	<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.	1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>	1 SWS
<b>Prüfungsanforderungen:</b> Students are expected to have developed an understanding for flow and transport dynamics in fractured and porous media on various scales and the respective wide range of analytical and numerical techniques. A literature review (report) or assigned project (report) should show the competence of the student to identify scale-dependent	

<p>flow and transport processes and find appropriate ways to assess them. In the case of an assigned project students are expected to independently (1) carry out laboratory experiments in unconsolidated/fractured (saturated or unsaturated) media or (2) to set up a numerical model for small- or large-scale flow and/or transport processes.</p>	
<p><b>Zugangsvoraussetzungen:</b> keine</p>	<p><b>Empfohlene Vorkenntnisse:</b> M.HEG.310 Basic knowledge of numerical modeling and/or programming</p>
<p><b>Sprache:</b> Englisch</p>	<p><b>Modulverantwortliche[r]:</b> Dr. rer. nat. Jannes Kordilla</p>
<p><b>Angebotshäufigkeit:</b> jedes Wintersemester1</p>	<p><b>Dauer:</b> 1 Semester</p>
<p><b>Wiederholbarkeit:</b> zweimalig</p>	<p><b>Empfohlenes Fachsemester:</b> 3</p>
<p><b>Maximale Studierendenzahl:</b> 4</p>	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.356: Planning, Working, Writing and Presenting in Science - Hydrogeochemistry</b> <i>English title: Planning, Working, Writing and Presenting in Science - Hydrogeochemistry</i>		5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. This module focusses on current research topics in organic and inorganic hydrogeochemistry, the application of hydrochemical tools or the interpretation of hydrogeochemical data. The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar		2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.		1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>		1 SWS
<b>Prüfungsanforderungen:</b> Deeper understanding of chemical processes in the aquatic environment, process based interpretation of hydrochemical data, knowledge on development and application of new tracers and indicators in geosystems, chemical analytical skills, experimental lab work, sampling strategies.		
<b>Zugangsvoraussetzungen:</b> M.HEG.13	<b>Empfohlene Vorkenntnisse:</b> Hydro(geo)chemistry, Transport processes	

<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> PD Dr. rer. nat. Tobias Licha
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	



<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.357: Planning, Working, Writing and Presenting in Science - Isotope Geochemistry</b> <i>English title: Planning, Working, Writing and Presenting in Science - Isotope Geochemistry</i>	5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. This module focusses on the application of modern isotope techniques to hydro(geo)logical and environmental research questions. Students will learn about isotope geochemistry and apply isotope methods to better understand complex hydro-geochemical processes (e.g. solute generation, water-rock interaction, surface water/groundwater interaction) in catchments and groundwater systems. The students will have to write a literature review report and prepare an oral presentation on a specific topic related to the use of isotopes in hydrogeology or environmental science. The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.	<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar	2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.	1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.	2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>	1 SWS
<b>Prüfungsanforderungen:</b> The student needs to demonstrate that she/ he has a profound understanding of isotope geochemistry and is able to conduct her/his own research by integrating isotope	

methods to interpret and model hydro(geo)chemical processes in an actual research project (M.Sc. thesis).	
---	--

<b>Zugangsvoraussetzungen:</b> M.HEG.11, M.HEG.13	<b>Empfohlene Vorkenntnisse:</b> keine
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Bettina Wiegand
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	

<b>Georg-August-Universität Göttingen</b> <b>Modul M.HEG.358: Planning, Working, Writing and Presenting in Science - Georeservoirs</b> <i>English title: Planning, Working, Writing and Presenting in Science - Georeservoirs</i>		5 C 4 SWS
<b>Lernziele/Kompetenzen:</b> The aim of this module is to introduce the students to the general workflow, writing and presenting in science. This comprises (1) how to obtain scientific data, (2) how to organize and summarize the relevant information in a report, and finally (3) how to prepare a clear and concise oral presentation of the report. Students can either choose an assigned project (laboratory/field work, programming/numerical modeling) or a literature research as a basis for their report and oral presentation. The topic of the report and presentation should be related to one of the respective lectures of the prerequisite module. Furthermore the students will have to participate in the weekly seminar of the Applied Geology department. This module focusses on Georeservoirs (processes, environments, characterization, applications). The skills acquired are expected to be invested into the preparation of the M.Sc. thesis.		<b>Arbeitsaufwand:</b> Präsenzzeit: 56 Stunden Selbststudium: 94 Stunden
<b>Lehrveranstaltung: Literature Review or Assigned Project (Übung)</b> <i>Inhalte:</i> The students will conduct either a literature study or an assigned project on a topic agreed with the supervisor. They will write a report and present their work in the seminar		2 SWS
<b>Prüfung: Hausarbeit (max. 10 Seiten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		3 C
<b>Lehrveranstaltung: Presentation of Literature Review or Project Work (Seminar)</b> <i>Inhalte:</i> This seminar will be organized during one semester. Besides their own presentation, the students are expected to participate also in the presentation of the other candidates.		1 SWS
<b>Prüfung: Präsentation (ca. 20 Minuten)</b> <b>Prüfungsvorleistungen:</b> 12 participations in the weekly seminar of the Applied Geology department, certified.		2 C
<b>Lehrveranstaltung: Applied Geology Seminar (Colloquium) (Seminar)</b>		1 SWS
<b>Prüfungsanforderungen:</b> Students are expected to have developed an understanding of flow and transport processes in georeservoirs, the respective characterization and modeling methods. Literature review (report) or assigned project (report) in the area of Geothermics and Georeservoirs.		
<b>Zugangsvoraussetzungen:</b> M.HEG.24	<b>Empfohlene Vorkenntnisse:</b> Insight into coupled THMC processes in georeservoirs, and knowledge of hydraulic and	

	tracer methods are of advantage (though not being mandatory)
<b>Sprache:</b> Englisch	<b>Modulverantwortliche[r]:</b> Dr. rer. nat. Iulia Ghergut
<b>Angebotshäufigkeit:</b> jedes Wintersemester1	<b>Dauer:</b> 1 Semester
<b>Wiederholbarkeit:</b> zweimalig	<b>Empfohlenes Fachsemester:</b> 3
<b>Maximale Studierendenzahl:</b> 4	